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C-A OPERATIONS PROCEDURES MANUAL

7.1.4 Compressor Room - Heat Exchanger Skid Operation

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Hand Processed Changes

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Approved: _____ *Signature on File* _____
Collider-Accelerator Department Chairman Date

E. Quimby

7.1.4 Compressor Room - Heat Exchanger Skid Operation

1. Purpose

This procedure provides instructions for the operation of the intercooler and aftercooler heat exchanger skids, which service the RHIC helium compressor system. The intercooler cools the helium between the first and second stage compressors. The aftercooler cools the helium leaving the second stage and redundant compressors. This OPM contains the following procedures relating to the operation of the heat exchanger skids:

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|-----------|-----|-------------------------------|
| Sections: | 5.1 | Evacuation of Heat Exchangers |
| | 5.2 | Purge of Heat Exchangers |
| | 5.3 | Startup Intercooler Skid |
| | 5.4 | Shutdown Intercooler Skid |
| | 5.5 | Startup Aftercooler Skid |
| | 5.6 | Shutdown Aftercooler Skid |

2. Responsibilities

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| 2.1 | The Shift Supervisor, or an operator designated by the Shift Supervisor, is responsible for conducting this procedure and for providing documentation in the Cryogenic Control Room Log. |
| 2.2 | Should a problem arise during the completion of this procedure, the Shift Supervisor shall contact the Technical Supervisor for instructions before continuing. |

3. Prerequisites

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| 3.1 | Operators shall be trained by the compressor room's cognizant engineer, and/or a person designated by the Operations Group Leader or Technical Supervisor, in the proper implementation of this procedure. |
| 3.2 | Operators shall become familiar with the intercooler skid P&ID 3A995023, the aftercooler skid P&ID 3A995024, and the physical location of components on the heat exchanger skids. |

4. Precautions

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|-----|---|
| 4.1 | Lockout-Tagout procedures shall be used when servicing any component on the heat exchanger skids. |
| 4.2 | Hearing protection shall be worn when the compressors are in operation. |

5. Procedure

5.1 Evacuation of the Intercooler and Aftercooler Heat Exchangers

This procedure is for evacuating and backfilling the heat exchangers. It should be performed anytime the helium side of the heat exchangers have been exposed to the atmosphere. Each individual heat exchanger may be evacuated independently or in conjunction with the medium and high-pressure helium headers.

- _____ [1] POSITION valves for evacuation. CLOSE Helium In and Helium Out valves, then OPEN vacuum valves.

<u>Heat Exchanger</u>	<u>Vacuum Valve</u>	<u>Helium In</u>	<u>Helium Out</u>
IC2650	V2680M	H2650M	H2651M
IC2651	V2681M	H2652M	H2653M
IC2652	V2682M	H2654M	H2655M
IC2653	V2683M	H2656M	H2657M
AC2700	V2713M	H2700M	H2701M
AC2701	V2712M	H2702M	H2703M
AC2702	V2711M	H2704M	H2705M
AC2703	V2710M	H2714M	H2707M

- _____ [2] BACKFILL each heat exchanger with pure helium to 1.5 atm by CLOSING Vacuum valves and CRACKING OPEN its Helium Inlet valve.
- _____ [3] REPEAT steps 1 and 2 for two more evacuate / backfill cycles.
- _____ [4] PRESSURIZE the heat exchangers internals to approximately 30 psi.
- _____ [5] RECORD in the Cryogenic Control Room Logbook that the heat exchanger skid has been evacuated and backfilled.

5.2 Purge of the Intercooler and Aftercooler Heat Exchangers

Note:

Each intercooler and aftercooler skid may be purged in entirety in conjunction with the main process piping during initial startup. There is no provision for purging each exchanger individually after maintenance.

5.3 Startup Intercooler Skid

This procedure describes how to bring intercooler heat exchangers on line. Three intercoolers are capable of handling the full compressor system flow.

- _____ [1] CONFIRM from this procedure or log book that the intercooler has been evacuated according to section 5.1.
- _____ [2] FILL the shell side of heat exchangers with cooling water by OPENING the water supply and return valves. ADJUST the flow as per [C-A-OPM 7.1.5, "Compressor Room - Water System Operation"](#).

<u>Heat Exchanger</u>	<u>Water Supply Valve</u>	<u>Water Return Valve</u>
IC2650	W2651M	W2650M
IC2651	W2653M	W2652M
IC2652	W2655M	W2654M
IC2653	W2657M	W2656M

- _____ [3] Vent any air through the shell side vent valves W2661M, W2662M, W2663M, and W2664M. This step involves opening the valves until water flows out instead of air.
- _____ [4] Confirm that the oil drain valves E2654M, E2655M, E2656M, E2657M, E2659M, E2660M, and E2662M are OPEN.

Note:

Water must be flowing through the heat exchangers and the oil drain valves must be open before flowing high temperature helium through the intercoolers.

- _____ [5] OPEN Helium Out and Helium In valves to bring each heat exchanger on line, as required.

<u>Heat Exchanger</u>	<u>Helium In</u>	<u>Helium Out</u>
IC2650	H2650M	H2651M
IC2651	H2652M	H2653M
IC2652	H2654M	H2655M
IC2653	H2656M	H2657M

- _____ [6] RECORD in the Cryogenic Control Room Logbook which heat exchangers are on line.

5.4 Shutdown Intercooler Skid

Any one of the four intercoolers may be shut down and isolated for maintenance or repair.

- _____ [1] CLOSE Helium Out, Helium In, and oil drain valves for the intercooler being worked on.

Note:

If the compressor system is on line, oil drain valves E2659M and E2655M shall NOT be CLOSED.

- _____ [2] Shut off the cooling water supply and return valves for the intercooler being worked on.
- _____ [3] RECORD in the Cryogenic Control Room Logbook which heat exchanger is off line.

5.5 Startup Aftercooler Skid

This procedure describes how to bring aftercooler heat exchangers on line. Three aftercoolers are capable of handling the full compressor system flow.

- _____ [1] CONFIRM from this procedure or log book that the aftercooler has been evacuated according to section 5.1.
- _____ [2] FILL the shell side of heat exchangers with cooling water by OPENING the water supply and return valves. ADJUST the flow as per [C-A-OPM 7.1.5 "Compressor Room - Water System Operation"](#).

<u>Heat Exchanger</u>	<u>Water Supply Valve</u>	<u>Water Return Valve</u>
AC2700	W2701M	W2700M
AC2701	W2703M	W2702M
AC2702	W2705M	W2704M
AC2703	W2707M	W2706M

- _____ [3] VENT any air through the shell side vent valves W2714M, W2715M, W2716M, and W2717M. This step involves opening the valves until water flows out instead of air.
- _____ [4] CONFIRM that valves H2715M and H2716 are CLOSED. These valves are for system purging and shall not be OPENED during normal operation.

- _____ [5] CONFIRM that the oil drain valves E2659M, E2655M (located on intercooler skid), and valves E2704M, E2705M, E2706M, and E2707M are OPEN.

Note:

Water must be flowing through the heat exchangers and the oil drain valves must be open before flowing high temperature helium through the aftercoolers.

- _____ [6] OPEN Helium Out and Helium In valves to bring each heat exchanger on line, as required.

<u>Heat Exchanger</u>	<u>Helium In</u>	<u>Helium Out</u>
AC2700	H2700M	H2701M
AC2701	H2702M	H2703M
AC2702	H2704M	H2705M
AC2703	H2714M	H2707M

- _____ [7] RECORD in the Cryogenic Control Room Logbook which heat exchangers are on line.

5.6 Shutdown Aftercooler Skid

Any one of the four aftercoolers may be shut down and isolated for maintenance or repair.

- _____ [1] CLOSE Helium Out, Helium In, and oil drain valves for the intercooler being worked on.

Note:

If the compressor system is on line, oil drain valves E2659M and E2655M (located on the intercooler skid) shall NOT be CLOSED.

- _____ [2] CLOSE cooling water supply and return valves for the heat exchanger being worked on.

- _____ [3] RECORD in the Cryogenic Control Room Logbook which heat exchanger is off line.

6. Documentation

- 6.1 The check-off lines on the procedure are for place-keeping only. The procedure is not to be initialed or signed, it is not a record.

- 6.2 The Shift Supervisor shall document the completion of the procedure in the Cryogenics Control Room Log.

7. **References**

- 7.1 P&ID drawings 3A995023 and 3A995024.
- 7.2 BNL Compressor Station Operating Manual Volume I as supplied by Koch Process Systems Inc.
- 7.3 [C-A-OPM 7.1.5, "Compressor Room – Water System Operation"](#).

8. **Attachments**

None